

CLAIMS

1. An audio-visual content transmission system comprising source (15) and destination stations (18, 19, 32) and a channel buffer (23-25, 28-33) distributed between the stations, the system including control means (53; 88) for controlling content to be reproduced at the destination station at a lower rate than a rate of production at the source station.
2. A system as claimed in claim 1, in which the control means (53; 88) is arranged to reproduce one frame and to maintain that frame until the buffer reaches a desired degree of fullness.
3. A system as claimed in claim 1, in which the control means (53; 88) is arranged to reproduce the content at a rate which is dependent on the normal reproduction duration of the content stored in the channel buffer.
4. A system as claimed in claim 3, in which the control means (53; 88) is arranged to reproduce one frame at the destination station, to maintain that frame until the buffer reaches a predetermined degree of fullness, and subsequently to reproduce the content at a rate lower than the production rate and then to increase gradually the reproduction rate.
5. A system as claimed in claim 3 or claim 4, in which the control means (53; 88) is arranged to reproduce the content at the destination station (18, 19, 32) at a substantially constant rate until a desired level of buffer fullness is reached.
6. A system as claimed in claim 3 or claim 4, in which the control means (53; 88) is arranged to increase the reproduction rate in a substantially linear fashion until the intended reproduction rate is reached.
7. A method of operating an audio-visual content transmission system comprising source (15) and destination (18, 19, 32) stations and a channel

buffer (23-25, 28, 29, 33) distributed between the stations, the method comprising controlling contents to be reproduced at the destination station at a lower rate than a rate of production at the source station.

5 8. A method as claimed in claim 7, in which the controlling step comprises reproducing one frame and maintaining that frame until the buffer reaches a desired degree of fullness.

9. A method as claimed in claim 7, in which the controlling step comprises  
10 reproducing the content at a rate which is dependent on the normal reproduction duration of the content stored in the channel buffer.

10. A method as claimed in claim 9, in which the controlling step comprises reproducing one frame at the destination station (18, 19, 32), maintaining that  
15 frame until the buffer reaches a predetermined degree of fullness, and subsequently reproducing the content at a rate lower than the production rate and then increasing gradually the reproduction rate.

11. A method as claimed in claim 9 or 10, in which the controlling step  
20 comprises reproducing the content at the destination station (18, 19, 32) at a substantially constant rate until a desired level of buffer fullness is reached.

12. A source station (15) for use in an audio-visual content transmission system, the source station including control means (53) for controlling content  
25 to be reproduced at a destination station (18, 19, 32) at a lower rate than the rate of production at the source station.

13. A station (15) as claimed in claim 12, in which the control means (53) is  
30 arranged to cause the reproduction at the destination station (18, 19, 32) of one frame, and to cause the maintenance of that frame until a buffer distributed between the source and destination stations reaches a desired degree of fullness.

14. A station (15) as claimed in claim 12, in which the control means (53) is arranged to control the reproduction of the content at a destination station (18, 19, 32) at a rate which is dependent on the normal reproduction duration of contents stored in a channel buffer distributed between the source and destination stations.
15. A station (15) as claimed in claim 14, in which the control means (53) is arranged to control the destination station (18, 19, 32) to reproduce one frame, to maintain that frame until the buffer reaches a predetermined degree of fullness, and subsequently to reproduce the content at a rate lower than the production rate and then increase gradually the reproduction rate.
16. A station (15) as claimed in claim 14 or claim 15, in which the control means (53) is arranged to control the reproduction of the content at the destination station (18, 19, 32) at a substantially constant rate until a desired level of buffer fullness is reached.
17. A station (15) as claimed in claim 14 or claim 15, in which the control means (53) is arranged to control the destination station (18, 19, 32) to increase the reproduction rate in a substantially linear fashion until the intended reproduction rate is reached.
18. A station as claimed in claim 14 or claim 15, in which the control means (53) is arranged to control the destination station (18, 19, 32) to decrease gradually the rate of reproduction rate increase.
19. A station as claimed in any of claims 12 to 18, in which the control means (53) forms part of a coder (20-22), which is arranged to code received content for provision to a or the channel buffer.

20. A station as claimed in claim 19, in which the control means (53) is arranged to effect field repeats at the destination station (18, 19, 32).
21. A station as claimed in claim 20, in which the control means (53) is  
5 arranged to apply time stamps such as to effect the repetition of fields at the destination station (18, 19, 32).
22. A station as claimed in claim 20 or claim 21 when dependent upon any  
of claims 14 to 18, comprising means (51) to determine a measure of inter-field  
10 motion, the control means (53) being arranged to effect field repeats only in respect of fields which are associated with relatively little inter-field motion.
23. A station as claimed in claim 22, in which the control means (53) is  
arranged to compare the measure of inter-field motion to a threshold, and to  
15 effect a field repeat only if the threshold is not exceeded.
24. A station as claimed in claim 23, in which the control means (53) is  
arranged to adjust the threshold in dependence upon a desired reproduction  
rate and the amount of field repetition effected.  
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25. A station as claimed in any of claims 19 to 24 when dependent on any  
of claims 14 to 18, comprising means (56) for repeating frames of audio  
samples.
- 25 26. A station as claimed in claim 25, comprising means (56) for aligning the  
start of a repeated frame of audio samples with the end of a preceding frame.
27. A station as claimed in claim 25 or claim 26, in which the coder (20-22)  
is a transcoder including an audio decoder (52) and an audio encoder (59) in  
30 series, the audio decoder being arranged to provide encoding information to  
the audio encoder.

28. A station as claimed in any of claims 25 to 27, comprising means (52) for determining the suitability of audio frames for repetition.
29. A station as claimed in any of claims 25 to 28, in which synchronisation control is provided by coupling of the means for effecting audio and video slowdown (53, 56).
30. A station as claimed in claim 12, including a personal video recorder or the like, the control means (53) being arranged to control the reproduction at the destination station (18, 19, 32) to equal substantially the intended reproduction rate.
31. A station as claimed in claim 30, comprising means responsive to a detection that the delay imposed by a buffer distributed between the source and destination stations is substantially equal to a desired delay to control the production rate of the personal video recorder or the like to equal substantially the intended production rate.
32. A station as claimed in claims 30 or claim 31, comprising means responsive to a jump event for deleting or disregarding data in a or the channel buffer.
33. A destination station (18, 19, 32) for use in an audio visual content transmission system, the destination station (18, 19, 32) including control means (88) for controlling content to be reproduced at a lower rate than a rate of production at the source station (15).
34. A station as claimed in claim 33, in which the control means (88) is arranged to reproduce one frame and to maintain that frame until buffer distributed between the source and destination stations reaches a desired degree of fullness.

35. A station as claimed in claim 33, in which the control means (88) is arranged to reproduce the content at a rate which is dependent on the normal reproduction duration of the content stored in a channel buffer distributed between the source and destination stations.

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36. A station as claimed in claim 35, in which the control means (88) is arranged to reproduce one frame, to maintain that frame until the buffer reaches a predetermined degree of fullness, and subsequently to reproduce the content at a rate lower than the production rate and then to increase gradually the reproduction rate.

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37. A station as claimed in claim 35 or claim 36, in which the control means (88) is arranged to reproduce the content at a substantially constant rate until a desired level of buffer fullness is reached.

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38. A station as claimed in claim 35 or claim 36, in which the control means (88) is arranged to increase the reproduction rate in a substantially linear fashion until the intended reproduction rate is reached.

39. A station as claimed in any of claims 35 to 38, comprising an integrated digital display and a decoder (103) operable to provide digital video signals having a frame rate at the lower rate.

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40. A station as claimed in claim 39, in which the decoder is operable to increase inactive times in its output thereby providing signals at the lower rate.

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41. A station as claimed in claim 39 or claim 40, in which the decoder (103) and a display controller (104) each include a phase locked loop (110, 111) locked by one or more commonly received signals.

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42. A system comprising a destination station as claimed in any of claims 40 to 41 and a source station (15) arranged to estimate buffer fullness at the

destination station and to operate a joint bit rate controller (27) on the basis of the estimation.

43. A station as claimed in any of claims 33 to 38, including an interlacer  
5 (83) arranged to repeat fields of a received video signal.

44. A station as claimed in claim 43 when dependent on any of claims 35 to  
38, comprising means (88) to monitor received signals representing a measure  
of inter-field motion, and to control the interlacer (83) to effect field repeats only  
10 in respect of fields which are associated with relatively little inter-field motion.

45. A station as claimed in claim 44, comprising means (88) to compare the  
measure of inter-field motion to a threshold, and to effect a field repeat only if  
the threshold is not exceeded.  
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46. A station as claimed in claim 45, comprising means (88) to adjust the  
threshold in dependence on a desired reproduction rate and the amount of  
field repetition effected.

20 47. A station as claimed in any of claims 43 to 46 when dependent on any  
of claims 35 to 38, comprising means (87) for repeating frames of audio  
samples.

48. A station as claimed in claim 47, comprising means (87) for aligning the  
25 start of a repeated frame of audio samples with the end of a preceding frame.

49. A station as claimed in claim 47 or claim 48, comprising means (87) for  
determining the suitability of audio frames for repetition.

30 50. A station as claimed in any of claims 47 to 49, in which synchronisation  
control is provided by coupling of the means for effecting audio and video slow  
down (83, 87).

51. A station as claimed in any of claims 33 to 38, comprising an integrated digital display, including a picture improvement processor (121) arranged to effect frame rate conversion.

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52. A station as claimed in any of claims 35 to 38, comprising means (84) for producing television frames at a rate lower than the intended frame rate.

53. A station as claimed in claim 52, comprising means (88) to control the clock signal of a digital encoder (84) to adopt a lower frequency than an intended clock frequency.

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54. A system as claimed in claim 1, in which the source station is as claimed in any of claims 12 to 32.

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55. A system as claimed in claim 1 or claim 54, in which the destination station is as claimed in any of claims 33 to 41 or any of claims 43 to 53.